REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections and further examination are requested. Upon entry of this amendment, claim 27 is amended and claim 28 is cancelled, leaving claims 21 and 27 pending with claims 21 and 27 being independent. No new matter has been added.

Rejections Under 35 U.S.C. §102(b)

Claim 27 has been rejected under 35 U.S.C. §102(b) as being anticipated by Shintani (JP 11-080952).

The present invention, as recited in claim 27, is designed to solve the problem in which physical properties of a film change when magnesium oxide (MgO) film of a metal oxide film is formed. In other words, the present invention has determined that when a lack of oxygen or impurities, such as C or H, are mixed in with MgO, bonding between the Mg atoms and the O atoms becomes disordered. As a result, dangling bonds which are not related to bonding are generated, causing the state of secondary electron emission to change.

Thus, the present invention, as recited in claim 27, covers an apparatus that includes a controlling means for controlling the partial pressure of a certain gas in a deposition room within a certain range, has a gas introducing means for introducing a first gas and a second gas together in the deposition room, the first gas containing oxygen gas to suppress oxygen deficiency in the metal oxide film, and the second gas containing at least one gas selected from the group consisting of water vapor, hydrogen, carbon monoxide, and carbon dioxide, and the controlling means controlling the partial pressure of each gas introduced into the deposition room within a controlled range.

Therefore, stabilizing characteristics of a protective layer is achieved by controlling the amount of the oxygen deficiency in the metal oxide film.

On the other hand, Shintani discloses a process of forming an MgO film onto a substrate, including detecting the degree of the vacuum in the deposition room, so that the detected vacuum degree is equivalent to the set value, keeping the vacuum degree in the deposition room within a

certain range by releasing the exhaust from the deposition room by an exhausting means, detecting the partial pressure of the oxygen gas in the deposition room, keeping the partial pressure of the oxygen within a certain range by controlling the amount of oxygen introduced into the deposition room by the Mass Flow Controller (MFC) so that the detected value is equivalent to the set value. That is, Shintani discloses the method of forming an MgO film, the method comprising: controlling the vacuum degree in the deposition room and the partial pressure of the oxygen gas within a certain range. However, Shintani fails to disclose a control means for controlling any gas other than the oxygen gas.

Additionally, there is no reasoning in the prior art to modify Shintani such that it would have rendered claim 27 obvious. Any such reasoning would be improper hindsight.

Therefore, Applicants submit that independent claim 27 is allowable over the cited prior art.

Rejections Under 35 U.S.C. §103(a)

Claims 21 and 28 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shintani in view of Okuyama et al. (JP 2001-243886), Kawakusu et al. (JP 2000-277009) and Furuya (JP 09-295894).

Applicants traverse this rejection and submit that claim 21 is allowable over the cited prior art. Specifically, independent claim 21 recites a method of manufacturing a plasma display panel (PDP) comprising a process of forming a metal oxide film made from magnesium oxide onto a substrate of the plasma display panel, the process of forming the metal oxide film comprising introducing oxygen gas into the deposition room and controlling a partial pressure of the oxygen gas within a range from $3x10^{-3}$ Pa to $3x10^{-2}$ Pa, so as to suppress oxygen deficiency in the metal oxide film, and introducing another gas to increase oxygen deficiency in the metal oxide film, the another gas including at least one gas selected from the group consisting of water vapor, hydrogen, carbon monoxide, and carbon dioxide into the deposition room, wherein when the another gas includes water vapor, controlling a partial pressure of the water vapor within a range from $1x10^{-4}$ Pa to $1x10^{-3}$ Pa, wherein when the another gas includes hydrogen, controlling

a partial pressure of the hydrogen within a range from $1x10^{-3}$ Pa to $5x10^{-2}$ Pa, wherein when the another gas includes carbon monoxide, controlling a partial pressure of the carbon monoxide within a range from $1x10^{-3}$ Pa to $5x10^{-2}$ Pa, and wherein when the another gas includes carbon dioxide, controlling a partial pressure of the carbon dioxide within a range from $1x10^{-4}$ Pa to $3x10^{-3}$ Pa.

As recognized by the Examiner, Shintani fails to disclose or render obvious introducing another gas including at least one of water vapor, hydrogen, carbon monoxide, and carbon dioxide, and controlling the partial pressure of the oxygen gas and the another gas. For this element, the Examiner relies on the combination of Okuyama, Kawakusu, and Furuya.

Applicants submit that such a combination fails to disclose or render obvious each element of independent claim 21. In particular, Okuyama discloses a method of forming an MgO film, wherein H_2O, CO, and CO_2 contained in the gas which has been introduced are given as examples of impurities, and where the impurity level in the decompression atmosphere is not more than 110 ppm. In addition, when controlling the crystalline orientation and crystalline shape of the MgO film, it is preferable to use H_2 or N_2, and when suppressing oxygen deficiency in the MgO film, it is preferable to use oxygen gas.

Further, Okuyama discloses that hydrogen and oxygen gas are introduced into the deposition room in accordance with its individual purpose. However, Okuyama does not disclose the particular steps of claim 21. That is, Okuyama does not disclose that the process of forming the MgO film comprises introducing two or more types of gases together in the deposition room, controlling the partial pressure of each gas, introducing the partial pressure into the deposition room, and controlling the amount of oxygen deficiency in the MgO film.

In addition, Okuyama does not disclose controlling the partial pressure of hydrogen and oxygen gas in the deposition room, nor does it disclose controlling the amount of oxygen deficiency in the MgO film.

Kawakusu discloses a process of forming MgO on a substrate, attempting to reduce the gas absorption of an MgO film. When filming, oxygen partial pressure is set at 1×10^{-5} - 1×10^{-4} Torr (1.33×10^{-3} to 1.33×10^{-2} Pa), and the substrate temperature is set at 250°C or more.

Although Kawakusu arguably discloses that the oxygen partial pressure and the substrate temperature are controlled within a predetermined range, Kawakusu does not disclose the particular steps of claim 21. That is, as with Okuyama, Kawakusu does not disclose that forming the MgO film comprises introducing two or more types of gases together in the deposition room, controlling the partial pressure of each gas, introducing the partial pressure into the deposition room, and controlling the amount of oxygen deficiency in the MgO film.

Furuya discloses a process of forming MgO on a substrate, including controlling the partial pressure of the hydrogen from 10^{-3} to 10^{-4}Torr (from 1.33×10^{-2} Pa to 1.33×10^{-1} Pa). Additionally, production of an MgO film is carried out in Furuya while a predetermined amount of hydrogen gas or water vapor is provided.

Furuya attempts to obtain a fine MgO film having an excellent crystalline orientation and small-sized crystalline particles, so hydrogen atoms in an excited state or in ionization are contained in the atmosphere of the deposition space. However, Furuya does not disclose or even mention oxygen deficiency or the particular steps of independent claim 21, i.e., controlling the amount of oxygen deficiency in the MgO.

Thus, this combination of references fails to disclose each element of claim 21. Additionally, Applicants submit that there is no reasoning to modify the cited prior art such that the combination of Shintani, Okuyama, Kawakusu, and Furuya would have rendered claim 21 obvious. Therefore, Applicants submit that independent claim 21 is allowable.

Applicants submit that this rejection is moot with respect to claim 28, since claim 28 has been cancelled. However, Applicants note that independent claim 27 is allowable over this combination for substantially similar reasons. That is, the cited prior art fails to disclose or render obvious an apparatus for manufacturing a plasma display panel (PDP) wherein the gas-introducing means introduces the first gas and the second gas into the deposition room, and the control means controls the first gas and the second gas to be introduced into the deposition room such that the partial pressure of the first and second gasses is within a controlled range.

Claims 21 and 28 have been rejected under 35 U.S.C. §103(a) as being unpatentable over

Shintani in view of Okuyama, Kawakusu and Shiokawa (U.S. 2003/0077972).

Applicants submit that claim 21 is allowable for the reasons set forth above, since Shiokawa fails to overcome the deficiencies of the combination of Shintani, Okuyama and Kawakusu. In particular, Shiokawa discloses a process of forming MgO on a substrate, attempting to effectively suppress water absorption of the MgO film, a gas atmosphere with the partial pressure of the vapor at 10 mPa (1 x 10-2 Pa). However, Shiokawa fails to disclose or render obvious introducing a gas for suppressing oxygen deficiency and a gas for increasing oxygen deficiency together in the deposition room, controlling the partial pressure of each gas within a controlled range so as to control the amount of oxygen deficiency in the MgO film, and controlling the change in physical properties of the film during the production of the film.

Applicants submit that this rejection is moot with respect to claim 28, since claim 28 has been cancelled. However, Applicants note that independent claim 27 is allowable over this combination for substantially similar reasons. That is, the cited prior art fails to disclose or render obvious an apparatus for manufacturing a plasma display panel (PDP) wherein the gas-introducing means for introduces the first gas and the second gas into the deposition room, and the control means controls the first gas and the second gas to be introduced into the deposition room such that the partial pressure of the first and second gasses is within a controlled range.

Claims 21 and 28 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shintani in view of Okuyama, Kawakusu and Shiokawa as applied above and further in view of Nishimura et al. (U.S. 2004/0135506).

Applicants submit that claim 21 is allowable for the reasons set forth above, since Nishimura fails to overcome the deficiencies of the combination of Shintani, Okuyama, Kawakusu and Shiokawa. In particular, Nishimura attempts to improve certain characteristics, such as lower discharge voltage, higher luminance, higher efficiency, and longer life. Impure gas (at least one of carbon dioxide and water vapor) other than inert gas is introduced and adsorbed by phosphor layers before sealing the periphery of the substrates. However, Nishimura does not disclose controlling the atmosphere of the deposition space for producing an MgO film as pointed out by the Examiner.

Applicants submit that this rejection is moot with respect to claim 28, since claim 28 has been cancelled. However, Applicants note that independent claim 27 is allowable over this combination for substantially similar reasons. That is, the cited prior art fails to disclose or render obvious an apparatus for manufacturing a plasma display panel (PDP) wherein the gas-introducing means for introduces the first gas and the second gas into the deposition room, and the control means controls the first gas and the second gas to be introduced into the deposition room such that the partial pressure of the first and second gasses is within a controlled range.

Double Patenting Rejection

Claim 21 has been provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 6 of copending Application No. 10/532,672 in view of Shintani, Kawakusu and further in view of Furuya or Shiokawa and Nishimura.

Applicants respectfully request that this double patenting rejection be withdrawn, since, as stated above, none of the cited references either alone or in combination discloses or renders obvious introducing a gas for suppressing oxygen deficiency and a gas for increasing oxygen deficiency together in the deposition room, controlling the partial pressure of each gas within a controlled range so as to control the amount of oxygen deficiency in the MgO film, and controlling the change in physical properties of the film during the production of the film.

Conclusion

In view of the foregoing amendments and remarks, all of the claims now pending in this application are believed to be in condition for allowance. Reconsideration and favorable action are respectfully solicited.

Should the Examiner believe there are any remaining issues that must be resolved before this application can be allowed, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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